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University of Oklahoma computer scientist Samuel Lee is not content to leave the visually handicapped trapped in a world of darkness, unable to find productive jobs, to live independently.

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# The Talking Typewriter

By DONNA MURPHY

**“Y**ou can call anytime of the day, and he is there, sitting alone. Yet, you talk with him for just a moment, and you know he is intelligent. He would like to have a job, to live independently, but he is blind.”

An expression of concern crosses the speaker's face momentarily.

That concern, first experienced five years ago during a visit to special classes for the visually impaired, has driven OU professor Samuel C. Lee. The end product of his concern is a talking typewriter.

Actually, Lee's talking typewriter has evolved into a talking micro-computer that offers the visually impaired a chance for independent living. The equipment can be used for job training or for educating blind children or for communicating, sharing ideas and dealing with the sighted world.

“And anyone who has this machine at home — where he can play with it for 24 hours a day — must be good at it,” Lee stresses.

Proving that the visually impaired can be trained to be productive employees still is Lee's passion today—some five years after that first school visit graphically depicted the need for specialized equipment to help the visually impaired.

“We found that they were very, very behind academically and socially,” Lee says of the visually impaired students. “They use Braille, which limits severely their educational opportunities. Few teachers



*The 1,000 instructions on this talking typewriter chip would have required a room-sized computer 20 years ago.*

know Braille, and the students cannot communicate if they can't write or type in English.”

The school for the visually impaired which Lee visited was using a standard typewriter as a teaching aid, requiring a teacher to work one-to-one with each student to tell him if the word or sentence were typed correctly.

A professor of electrical engineering and computer science at OU, Lee is nationally renowned in the field of digital switching theory and the author of a “definitive work” in his spe-

cialty. He decided to direct some of his expertise and energies into helping the handicapped — a task he has tackled together with some of his students, giving them free reign to use their imaginations and skills to apply what they are learning in the classroom to the problems of handicapped persons.

“When we started we had very primitive hardware and didn't get far at all,” Lee recalls. But the idea was firmly planted, and soon Lee and his students had proven they could develop a typewriter that could talk. Their first version used a voice synthesizer to pronounce each letter as it was typed or the word that was typed.

The first viable model, developed by a graduate student from Collinsville, Oklahoma, Ted Wright, could pronounce each letter as a word was typed, say the complete word and read back the whole sentence. That was in 1979, developed with funding from a \$36,000 grant from the state department of education. Two of the typewriters were placed in special classes for the handicapped in Oklahoma City.

That typewriter and the work of Lee and his students brought national attention to the University in 1980 when the project was declared one of the Ten Outstanding Engineering Achievements in the United States, an honor conferred by the National Society of Professional Engineers.

Lee, however, was not content with the model, which had a capacity to hold some 3,000 words in its vocabulary memory bank. Although it carried many of the most commonly used words and a few word endings, it relied primarily on a table, much like a dictionary. If the word the student typed was on the table, the typewriter would pronounce it, but if the word were not there, the voice just pronounced a letter at a time.

So Lee joined with a visiting scholar from the Peoples Republic of China, Weijie Pan, and two graduate students to further refine the talking typewriter. The new version is a TRS-80 microcomputer that uses an improved voice synthesizer and employs English by rules — that is, Lee explains, “when you type a word, the machine divides it into parts and pronounces it just like you and I do. The new machine has 777 pronunciation rules, so any word you or I say can be pronounced by it also. These rules are derived from the grammar rules you and I were taught.”

The computer knows, for example, that in a word such as “kit” the “i” has a short sound, whereas when an “e” is added to the end, the word is pronounced “kite” with a long “i” sound, Lee explains.

“The memory also contains a list of special words that don’t follow the rules precisely,” Lee adds, noting that “Oklahoma” is one such word. According to grammar rules, the state would be pronounced with a short “o” sound at the beginning.

“By using a microcomputer, the system is much less expensive, making it possible for each person to have a computer installed at home,” Lee says.

For the past five years, the talking typewriter project has been promoted by Lee as a professional engineer and teacher, by OU students, and by representatives of state agencies working with the visually impaired. Lee is now ready to add a new dimension — the business community.

“We believe we can use the talking typewriter to train visually impaired people to perform certain jobs. We think it is a good idea; we’ve found a partner and hope to demonstrate that we can do it,” he says.

Using \$30,500 in private funds

from the University of Oklahoma Associates and the Alumni Association’s annual giving programs, Lee is joining with Southwestern Bell Telephone Co., which will provide several jobs for visually impaired persons trained first on the talking typewriter and then on any special machines used by the company.

Linda Weckel, Bell Telephone’s staff manager for employment, is working with Lee to identify jobs that she believes can be filled with visually impaired workers who have been trained on the talking typewriter.

Prospective candidates for these jobs will be identified — there are some 7,000 legally blind people in Oklahoma — then trained to type, program computers or to perform assorted other tasks. “We will be promoting individual training programs to those who are willing to work and who have the potential,” Lee explains.


To develop effective training sessions, the OU researchers are using job descriptions from the company and information on skills required for each job. Then they will recruit and screen candidates and teach them to type and perform related tasks on the talking typewriter. The company probably will follow up with additional, more specialized training on its own machines.

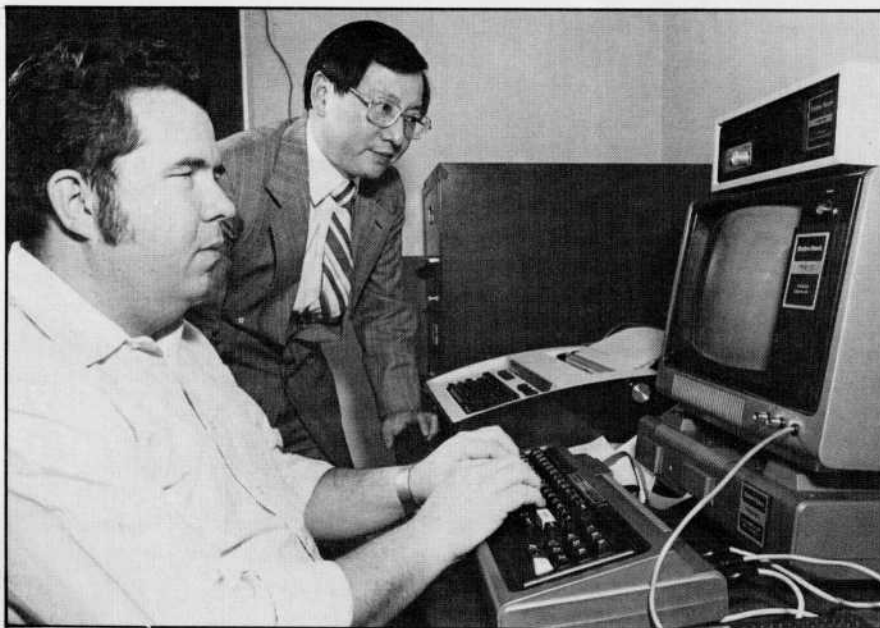
“This is a pilot experiment,” Lee says. “We hope to get other companies to make the same type of commitment once they see that the project works.”

Professor Lee is not alone in his efforts to help the visually impaired find jobs. The state sponsors a rehabilitative agency for the blind in Oklahoma, headed by Travis Harris, who himself is blind.

“We’re very appreciative of what Professor Lee has done in this area,” Harris says. “We have blind people in the state doing many things, but we need to gain more acceptance. Most people conceive blindness as tragic; they say ‘I’d rather be dead than blind.’ First we need to train blind people and then convince employers they can do the work. Placing blind people in jobs is a problem and probably always will be.”

But by involving industry in the training process, Lee hopes to help overcome part of that problem. “We no longer are concentrating on refining the talking typewriter, but on developing a useful training program tailored to the individual,” the OU professor explains.

Once they master the skills the talking typewriter offers, the blind will be better qualified to live as Lee envisions they should: productively and independently. 



*Although blind, Robert Moore is discovering that he can type and perform other clerical tasks by using the talking typewriter, developed over the past few years by OU’s Sam Lee and several of his computer science students.*